

MARTHA (31N-04E-18)

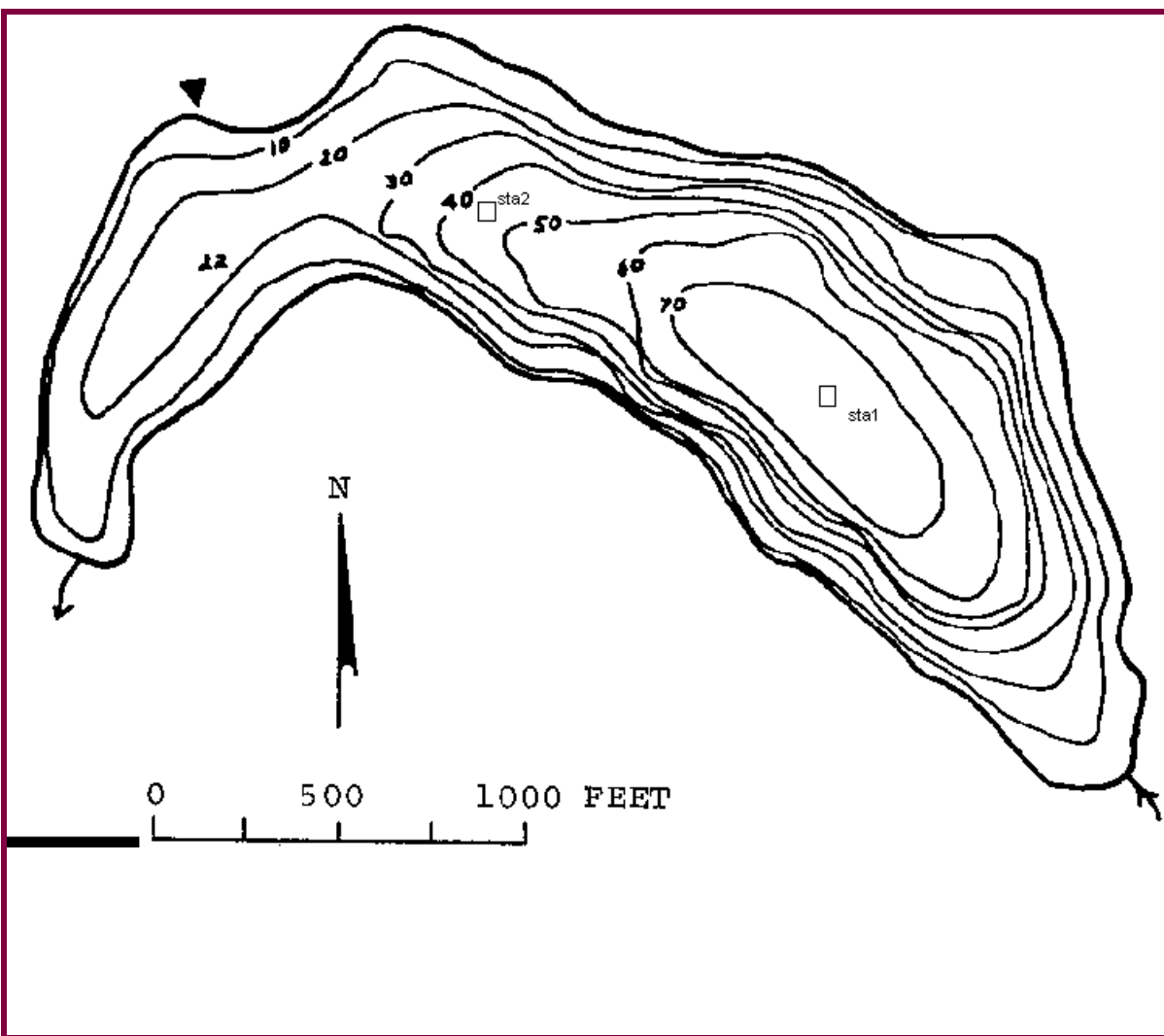
SNOHOMISH County

Lake ID: MARSN1

Ecoregion: 2

Lake Martha is located 10.5 miles northwest of Marysville, and one mile east of Warm Beach. It is fed by Lake Howard and drains to Port Susan. (Lake Martha is not the same lake as Martha Lake, which is located near Alderwood Manor.)

<i>Area (acres)</i>	<i>Maximum Depth (ft)</i>	<i>Mean Depth (ft)</i>	<i>Drainage (sq mi)</i>	
62	70	33	2	
<i>Volume (ac-ft)</i>	<i>Shoreline (miles)</i>	<i>Altitude (ft abv msl)</i>	<i>Latitude</i>	<i>Longitude</i>
2034	1.76	186	48 10 03.	122 20 46.



Station Information

MARSN1

Primary Station	Station # 1	latitude: 48 10 06.7	longitude: 122 20 12.7
	Description:	Deep site. In middle of lake approximate 1250 feet northwest of inflow at southeast corner.	

Secondary Station	Station # 2	latitude: 48 10 10.6	longitude: 122 20 27.5
	Description:	Located in middle of lake, about 750 feet east of boat launch (and about 250 feet south of boat launch in to the lake's middle).	

Trophic State Assessment for 1999

MARTHA (31N-04E-18)

Analyst: MAGGIE BELL-MCKINNON

TSI_Secchi:	^a	43
TSI_Phos:		41
TSI_Chla:		50
Narrative TSI:	^b	M

Summary Comments:

The general water clarity of Lake Martha was good to fair in 1999. The Secchi depth readings ranged from 2.4 meters (8.0 feet) to 5.0 meters (16.3 feet) with a mean Secchi depth of 3.4 meters (11.2 feet). For comparison, in 1998 the mean Secchi depth was 4.0 meters (13.1 feet).

Numerous geese and/or other waterfowl were observed on the lake by the volunteer monitor during six of her ten sampling visits made between May and September.

The chemistry data collected for Lake Martha showed moderate phosphorus levels.

Values ranged from 11.1 ug/L to 15.1ug/L in the epilimnion and hypolimnetic readings of 26.1ug/L to 75.5 ug/L. The chlorophyll levels showed high algae densities in the lake. The phosphorus data indicates a level of productivity where algae growth could become a problem but usually not for long periods of time. The volunteer monitor reported an large amounts of suspended algae in the lake beginning in late May and lasting until the end of August.

Ecology staff made four site visits in 1999. Thermal stratification and low dissolved oxygen levels in the hypolimnion were noted during each of these visits.

Ecology staff conducted an aquatic plant survey on 7/20/1999. The non-native plant *Nymphaea odorata* (fragrant waterlily) grew in one patch in the lake. Another non-native plant *Iris pseudacorus* (yellow flag) also occurred in a few locations around the lake. Only a few submersed plants were observed, mostly occurring at the mouth of an unnamed intermittent inflow stream located at the southeast corner of the lake.

Based on the Secchi depth data, and the phosphorus and chlorophyll levels, Lake

Martha is classified as mesotrophic.

The following is an assessment written by Ecology staff, Sarah O'Neal to determine the phosphorus criterion for Lake Martha:

Lake Martha is a small, deep lake. While nutrient levels and Secchi depths were consistent with a mesotrophic lake, chlorophyll-a levels were elevated. In fact, we noted that 1999 brought the worst algal conditions observed in many years on the usually clear lake. Slightly elevated hypolimnetic total phosphorus concentrations indicated slight internal nutrient loading. Additionally, dissolved oxygen dropped off in the hypolimnion, particularly in September, another indication of the potential for internal nutrient loading. A number of activities in the watershed may have been responsible for the productivity of the lake. In particular, there was an apparent increase in resident geese, which often add nutrients to a lake system. Homes with manicured lawns, many running down to the shoreline, surrounded the majority of the lake (an estimated two-thirds). Fertilizers, a common nutrient source, were clearly used on many of the lawns. Lawns are known to attract and sustain geese year round. Finally, agriculture was the primary land use within the watershed; farm runoff is another potential source of nutrients. Fortunately, plants were not a problem in the lake. Submerged plants grew only sparsely, and no problem species grew in or around the lake.

Nineteen residents and two visitors completed the questionnaire. They indicated a wide variety of uses including swimming, relaxing, watching wildlife, canoeing, kayaking, and using personal watercraft. All but one respondent answering the question about water quality agreed that water quality had worsened in the past decade or two. The respondents especially desired less algae, clearer water, good swimming, and fewer Canada geese on the lake. The lake and its surroundings provided habitat for eagles, hawks, grebes, and other waterfowl. Fish habitat was somewhat sparse on the lake, and consisted largely of human structures and aquatic plants. However, WDFW managed the lake primarily for rainbow trout. Between 1000 and 2000 catchable fish were planted each spring before opening day. Four inch brown trout were also planted in the fall. The fishery effectively utilized zooplankton, as indicated by a decrease in their average size over the summer. However, smaller forms dominated the zooplankton community, particularly later in the summer, indicating a possible overabundance of prey to predator species. Anadromous fish do not use Martha Lake. Warmwater fish species in the lake included largemouth bass, yellow perch, and brown bullhead. The lake received only about 50 anglers on opening day of its year-round season.

Despite increasingly dense algal growth, uses of the lake appeared to be largely supported. In order to maintain water quality of the lake and prevent increased nutrient loading, we recommend a total phosphorus criterion of 15.8 ug/L (mean 12.5 ug/L plus standard deviation of 3.3 ug/L).

Mean Secchi = 3.2m; Mean TP = 12.5 ug/L; Mean Chl = 7.6 ug/L

^a TSI Qualifiers: B or W-Secchi Disk hit bottom or entered weeds; J-Estimate; N-Fewer than the required number of samples

^b E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

MARTHA (31N-04E-18)

Date	Time	Strata	Tot P (ug/L)	Tot N (mg/L)	TN:TP	Chloro- phyll (ug/L)	Fecal Col. Bacteria (#/100mL)	Hardness (mg/L)	Calcium (ug/L)	Turbidity (NTU)
Station 0										
6/10/1999		L					3			
		L					4			
8/11/1999		L					13			
		L					9			
Station 1										
6/10/1999		E	15.1	.455	30	8.1		30.5	5760	.8
		H	57.5	.635	11					
7/16/1999		E	12.4	.584	47	10.5				
		H	75.5	.729	10					
8/11/1999		E	11.2	.637	57	11.2				1.2
		H	26.1	.728	28					
9/10/1999		E	11.1	.416	37	3.2				
		H	33.8	.811	24					
Station 2										
6/10/1999		E	11.9	.448	38	8.2				
7/16/1999		E	11.1	.571	51	11.6				
8/11/1999		E	11.1	.652	59	11.6				
9/10/1999		E	8.45	.415	49	3				

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than, G=Greater than.

Watershed Survey

MARTHA (31N-04E-18)

Survey Date: 9/10/1999

Land Uses (1 = Primary, 2 = Secondary, etc.)

☐ 1 Agriculture(commercial, not hobby)

☐ Residential

☐ Commercial, Industrial

☐ 2 Park, forest or natural

☐ Major transportation

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☐

Lack of buffer zones. Fertilizers used widely. Many docks in the H2O.

Odors ☐

None noted but volunteer stated that a septic system recently failed.

Cattle ☐ Ducks ☒ Geese ☐

5 ducks by residences (two in H2O, three in yard).

Fertilizers and weed killers appear to be used in residential or agriculture area ☒

Residences

Buffer zones around streams and wetlands ☒

A few homes had b.zs but most went w/o having them. Lawns ran to lake in many cases.

Irrigation ☐

Survey Id: 30

Habitat Survey Summary Report

MARTHA (31N-04E-18)

Data are averages of 10 Stations Surveyed

Date of Visit: 7/20/1999

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

Canopy Layer Avg:	2.0	Number of stations with canopy:	6
Understory Avg:	2.6	Number of stations with understory:	7

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

Canopy Layer:	trees > 0.3 m DBH	1.4
	trees < 0.3 m DBH	1.1
Understory:	woody shrubs saplings	1.8
	tall herbs, forbs grasses	1.1
Ground Cover:	woody shrubs seedlings	1.6
	herbs, forbs, grasses	3.4
	standing water or inundated veg	0.1
	barren or buildings	0.9
Substrate Type (within shoreline plot):	bedrock	0.0
	boulders	0.0
	cobble/gravel	0.8
	loose sand	0.3
	other fine soil/sediment	0.4
	vegetated	3.3
	other	0.4
Bank Features:	angle (0:<30; 1: 30-75; 2:nr vertical)	1.1
	vertical dist (M from wtrln to high wt):	0.0

horiz. dist. (M from wtrln to high wt): 0.0

Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)

buildings	1.0
commercial	0.0
park facilities	0.0
docks/boats	1.2
walls, dikes, or revetments	0.7
litter, trash dump, or landfill	0.0
roads or railroad	0.0
row crops	0.0
pasture or hayfield	0.0
orchard	0.0
lawn	1.4
other	0.0

Physical Habitat Characteristics

station depth (m; at 10 m from shore) 2.8

Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

bedrock	0.0
boulders	0.0
cobble	0.2
gravel	1.5
sand	1.3
silt	2.4
woody debris	0.8

Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

submergent	0.5
emergent	0.7
floating	0.1
total weed cover	1.1

Do macrophytes extend lakeward (-1 = yes, 0 = no) -0.3

Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)

aquatic weeds	1.0
snags	0.0
brush or woody debris	0.8
inundated live trees	0.3
overhanging vegetation	0.8
rock ledges or sharp dropoffs	0.0
boulders	0.0
human structures	1.2

Questionnaire

MARTHA (31N-04E-18)

Results compiled from 31 Surveys. Average time (years) respondents spent on lake: 19.38

Did the following add (+1), detract (-1), or have no effect (0) on your enjoyment of the lake today?

Types of WaterCraft:	0.5	View:	0.6	Distance to Lake:	0.2
Public Access:	-0.2	Swim Beach:	0.5	Canada Geese:	-0.8
Water Clarity:	-0.1	Water Qual. for Swim:	-0.1		
Fishing Quality:	0.2	Aquatic Plants:	-0.4		

On a scale of 1 (poor) to 5 (excellent), how would you rate water quality today? 2.8

Which would you rather have, 1 or 2?

- | | |
|---|-----|
| 1) Better fishing and more natural habitat, or 2) clearer water? | 1.5 |
| 1) Better fishing and more natural habitat, or 2) fewer aquatic plants? | 1.3 |
| 1) Clearer water, or 2) fewer aquatic plants? | 1.0 |

How important is each of the following characteristics to you (1 = very undesirable, 5= very desirable):

Restricted Watercraft:	4.2	Good Warmwtr Fishing:	2.8	Natural Scenery:	4.3
Plant Growth:	2.2	Good Swimming:	4.4	Public Beach:	1.8
Natural Shoreline:	3.7	Less Algae:	4.5	Canada Geese:	1.4
No Odors:	4.2	Public Access:	2.5		
Good Coldwtr Fishing:	3.8	Clear Water:	4.5		

Tabulated Results

Survey ID	Date	-----Residency-----	Rent or Own	Primary Activity*	-----Water Clarity----- Purchase Factor?	Has it Changed?	When?
94	8/8/1999	Resident	Permanent	Rent	3	<input checked="" type="checkbox"/>	No
99	7/5/1999	Resident	Permanent	Rent	live on lake	<input type="checkbox"/>	Worse 1985
115	9/10/1999	Resident	Permanent	Own	2	<input type="checkbox"/>	No
133	7/27/1999	Resident	Permanent	Rent	10	<input type="checkbox"/>	Worse 1996
182	7/3/1999	Resident	Permanent	Rent	10	<input checked="" type="checkbox"/>	Unknown
184	7/4/1999	Resident	Seasonal	Rent	6	<input type="checkbox"/>	Worse 1994
185	7/3/1999	Resident	Permanent	Rent	7	<input checked="" type="checkbox"/>	Unknown
186	7/5/1999	Resident	Permanent	Rent	6	<input checked="" type="checkbox"/>	Worse
187	7/6/1999	Resident	Permanent	Rent	10	<input checked="" type="checkbox"/>	Worse 1983
188	7/4/1999	Resident	Seasonal	Rent	6	<input type="checkbox"/>	Worse
190	7/8/1999	Resident	Permanent	Rent	6	<input checked="" type="checkbox"/>	Worse 1996
193	7/3/1999	Resident	Permanent	Own	2	<input type="checkbox"/>	Unknown
194	7/7/1999	Resident	Permanent	Rent	7	<input type="checkbox"/>	Unknown
195	7/9/1999	Resident	Seasonal	Rent	10	<input type="checkbox"/>	Worse
196	7/9/1999	Resident	Permanent	Rent	6	<input type="checkbox"/>	Worse 1994
197	7/8/1999	Resident	Permanent	Rent	6	<input type="checkbox"/>	No
198	7/8/1999	Resident	Seasonal	Rent	6	<input type="checkbox"/>	Worse
199	7/3/1999	Resident	Permanent	Rent	7	<input type="checkbox"/>	No

200	7/5/1999 Resident	Permanent	Rent	0	<input checked="" type="checkbox"/>	Worse	1989
202	7/5/1999 Visitor			7	<input type="checkbox"/>	Worse	1998
203	7/3/1999 Resident	Permanent	Rent	6	<input type="checkbox"/>	Unknown	
204	7/5/1999 Visitor			7	<input type="checkbox"/>	Worse	
205	7/4/1999 Resident	Permanent	Rent	2	<input checked="" type="checkbox"/>	Worse	1995
207	7/6/1999 Resident Kill the geese	Seasonal	Rent	home maintenance	<input type="checkbox"/>	Worse	
209	7/16/1999 Resident	Permanent	Rent	paddle boat	<input checked="" type="checkbox"/>	No	
211	7/13/1999 Resident	Permanent	Rent	7	<input checked="" type="checkbox"/>	Better	1995
212	7/15/1999 Resident	Permanent	Rent	2	<input checked="" type="checkbox"/>	Worse	1990
214	7/17/1999 Resident		Rent	2	<input checked="" type="checkbox"/>	Worse	
215	7/15/1999 Resident	Permanent	Rent	0	<input checked="" type="checkbox"/>	No	
216	7/15/1999 Resident	Permanent	Rent	2	<input checked="" type="checkbox"/>	Worse	1990
217	7/9/1999 Resident	Permanent	Rent	1	<input checked="" type="checkbox"/>	Worse	1996

* 1=canoe/kayak, 2=fish, 3=pers. wtrcrt, 4=mtrboat, 5=sail, 6=swim/wade, 7=watch wldlf, 8=ski, 9=windsurf, 10=relaxing

Zooplankton Report

MARSN1

Date 6/10/1999 Station: 1 Less than 1/8 mLs measured.
Sample ID 86

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.87

Date 6/10/1999 Station: 2 Slightly less than 0.5mL measured. Some algae and rotifers.
Sample ID 73

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.66

Date 8/11/1999 Station: 1 Length of tow not labeled. Lots of nostoc in sample.
Sample ID 39

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.45

Date 8/11/1999 Station: 2 Length of tow not labelled.
Sample ID 57

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.39

Aquatic Plant Data

MARTHA (31N-04E-18)

Sampler: Parsons, O'Neal

Survey Date: 7/20/1999

Max depth of growth (M): 2.5

Comments Sunny, calm. Habitat survey done. Sediment mostly gravelly with silt overlay. Few submersed plants except at the inflow. Much algae in the water. Much of shoreline very manicured, some more natural sections.

SPECIES LIST

Scientific Name	Common Name	Dist ^a	Comments
<i>Chara sp.</i>	muskwort	1	
<i>Elodea canadensis</i>	common elodea	2	only one very dense patch found, reported to have 4 leaves in past years
<i>Iris pseudacorus</i>	yellow flag	2	
<i>Juncus sp.</i>	rush	2	
<i>Nuphar polysepala</i>	spatter-dock, yellow water-lily	2	patches
<i>Nymphaea odorata</i>	fragrant waterlily	1	one pink flowered patch
<i>Potentilla palustris</i>	purple (marsh) cinquefoil	2	
<i>Potamogeton sp (thin leaved)</i>	thin leaved pondweed	2	at SE end
<i>Typha latifolia</i>	common cat-tail	1	

^a 0 - value not recorded (plant may not be submersed)

2 - few plants, but with a wide patchy distribution

4 - plants in nearly monospecific patches, dominant

1 - few plants in only 1 or a few locations

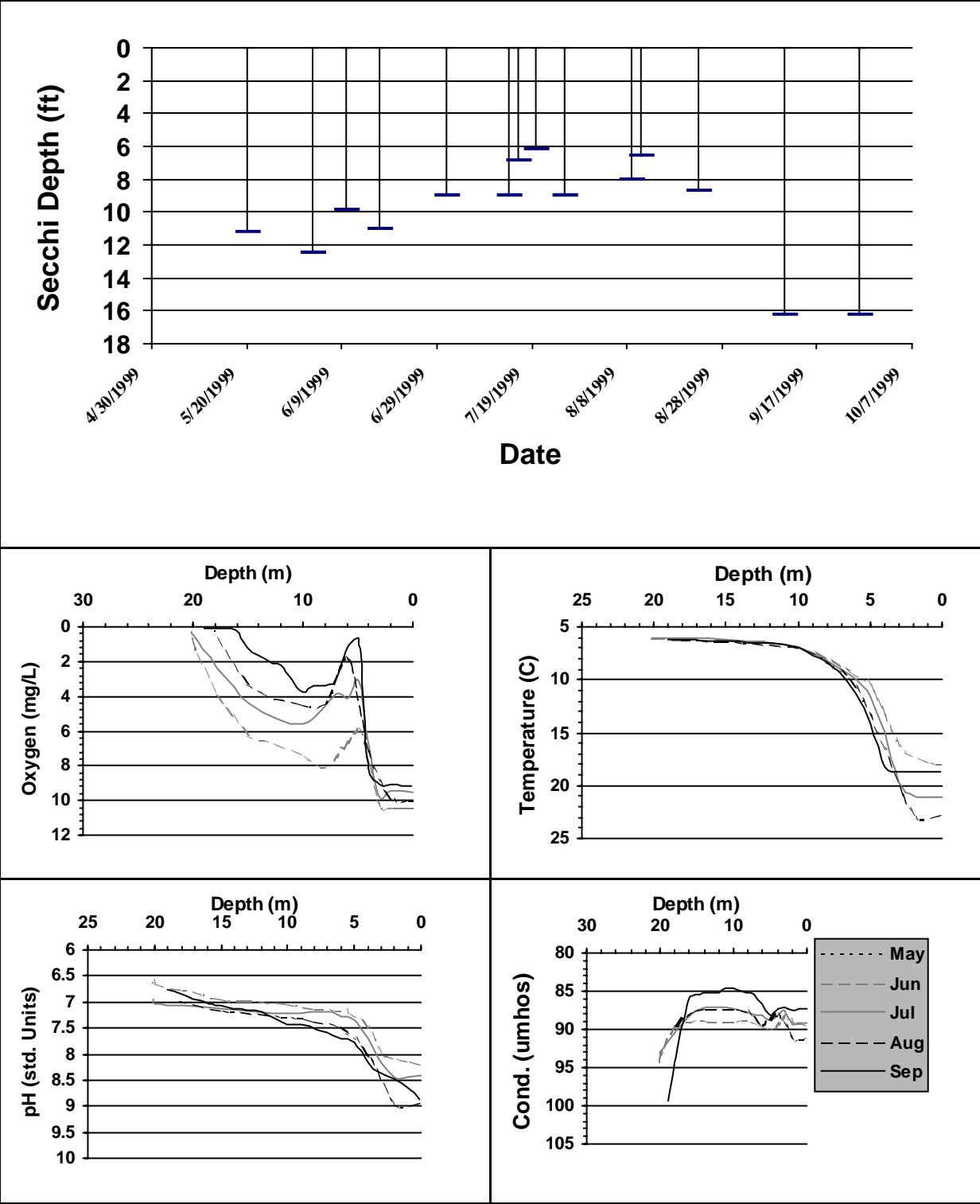
3 - plants in large patches, codominant with other plants

5 - thick growth covering substrate to exclusion of other species

Secchi Depth and Profile Graphics

Station: 1

MARSN1



Secchi Data and Field Observations

MARTHA (31N-04E-18)

Date	Time	Temp- erature (F)	Secchi (ft)	Color (1-greens, 11-browns)	Bright- ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5- good)	Swimming (1-poor, 5- good)	Geese (#)	Waterfowl (besides geese #)	Boats- Fishing (#)	Boats- Skiing (#)
Station 1													
5/20/1999		15	11.25	8	50	2	4	4	3	3	7	1	0
	Sampler: DEAN			Remarks: Used a view tube. Very large clumpy particulate.									
6/3/1999		18	12.5	7	0	2	1	4	4	0	5	1	0
	Sampler: DEAN			Remarks: Used a view tube. Beautiful day. Total of 1.1 inches rain Memorial Day and Sunday.									
6/10/1999			9.84	7	75	1	1	5	5	30	1	0	0
	Sampler: SMITH			Remarks: Mostly residential, some timber but a church has purchased nearby timber land. Some new homes just built in shed. Only about a third of shoreline natural--rest residents.									
6/17/1999		21	11	8	25	1	1	5	4	27	2	0	0
	Sampler: DEAN			Remarks: Used a view tube. Small particulate. Rosa nutkana in bloom.									
7/1/1999		19	9	8		1	5		3	24	0	0	0
	Sampler: DEAN			Remarks: Used a view tube. Within the last two days rained 0.8 inches. Water like looking through snow storm. Algae scum in cove around dock - pale green.									
7/14/1999		21.5	9		75	3	2	4	4	0	0	0	0
	Sampler: DEAN			Remarks: Used a view tube. Still a whiteout!									
7/16/1999			6.89	6	80	3	1	4	2	18	1	0	0
	Sampler: SMITH			Remarks: Considerable algal bloom--worst I've seen on this lake. Bald eagle observed.									
7/20/1999			6.23										
	Sampler: Parsons			Remarks:									
7/26/1999		21	9	7	0	3	2	4	4	0	0	1	0
	Sampler: DEAN			Remarks: Used a view tube. Still heavy algae. Two families of geese are still on the lake. Heard pied-billed grebe.									
8/9/1999		23	8	6	25	1	2	4	3	9	11	1	0
	Sampler: DEAN			Remarks: Used a view tube. The clarity is beginning to worry me. Color #6 isn't really correct but I wanted to indicate a color change.									
8/11/1999			6.6	3	100	3	1	4	3	0	0	0	0
	Sampler: SMITH			Remarks: The greenist I've ever seen the lake. Fec #1 approx. 70 meters east of boat launch near old pier. Fec #2 at boat launch. Red tailed hawk observed.									

Date	Time	Temp- erature (F)	Secchi (ft)	Color (1-greens, 11-browns)	Bright- ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5-good)	Swimming (1-poor, 5-good)	Geese (#)	Waterfowl (besides geese #)	Boats- Fishing (#)	Boats- Skiing (#)
8/23/1999		22	8.75	7	0		2	4	4	0	0	0	0
	Sampler: DEAN				Remarks: Used a view tube.								
9/10/1999		18.5	16.25	7	0	1	1	5	5	0	0	0	0
	Sampler: DEAN				Remarks:								
9/26/1999		17	16.25	6	50	1	5	5	5	0	0	0	0
	Sampler: DEAN				Remarks: Used a view tube. Rained 0.6 inches in about 45 minutes last night. Very windy yesterday. Some small particulate.								